

in their range, having been carried by modern transport to new countries, where they have wrought even more damage than in their original homes, and this modern danger, linked with the control of plant imports, has also had a large share in the recognition of the importance of Applied Entomology, and the Economic Entomologist nowadays has not only to deal with the pests of his own country but has to endeavour to exclude foreign insects, which may become pests if imported. If his information is to be adequately complete, therefore, he must study the habits and control of insects, which are known or are likely to be pests, practically throughout the world, and must also know something of insects which may be employed to check weeds, and so on.

The methods of control of insects have also changed greatly during the last half-century. Fifty years ago, the stock-in-trade of the economic entomologist consisted largely of arsenicals and kerosine-emulsion, with a little pyrethrum for household insects, and little practical use was made of natural control by parasites, predators or diseases. Nowadays, methods of biological, chemical, mechanical and legislative control produce an ever-increasing volume of information to be assimilated and practised by the economic worker, and it is impossible to refer even briefly to all such methods in a short *résumé*. In the United States alone, for example, the U.S. Patents relating to Pest Control provide material for a monthly Review on this one subject. The technique of the introduction and breeding of parasites is large and complex and the necessity for the study of recently-introduced pests in their original homes is also a development of recent years.

Special training of Economic Entomologists is also a development within the last three decades. Previously, work in Applied Entomology was usually carried out by entomologists—often at first appointed in an honorary capacity, of which one effect was to retard progress, as Governments are apt to regard as of little importance scientific work which is done for them free of charge and usually without thanks—who had an innate keenness for the study of insects. Nowadays, recruitment to such posts is usually made from students trained *ad hoc*. With a few exceptions to prove the rule, however, it seems doubtful whether the modern method produces very satisfactory results—and I have heard the same criticism in other branches of biological work, in which the innate keenness of the man concerned seems to be the most important item in his equipment.

And the future? Here we may perhaps quote the words of Dr L. O. Howard, who has played such a great part in the development of Economic Entomology:—"The intelligence of the human race, *if brought to bear*, will conquer the insect menace."

THE DERMAPTERA: HISTORICAL NOTES.

By W. D. HINCKS, F.R.E.S.

The study of the Dermaptera or Earwigs in its early stages was bound up with the Orthoptera of which Order they were long regarded as a family, the *Forficulidae*. Even now many naturalists find it difficult to dissociate the two Orders in their minds, although it is probable that they are really not closely related. It is true that the very limited

Dermapterous fauna of our own islands and also of European countries has led to the continued inclusion of the Earwigs in Orthoptera works on the grounds of convenience. It is also true that a considerable amount of work has been devoted to the Dermaptera alone, and a tradition and historical background has become associated with the Order and the workers, whose past labours have done so much to elucidate this small but very difficult group.

About the middle of last century H. Dohrn produced a preliminary monograph exclusively dealing with earwings (1863-1867). Earlier (1839) Audinet de Serville had contributed a general survey in his "Histoire Naturelle des Insectes Orthoptères" and later Brunner von Wattenwyl, Bolivar, Fieber, Stål, Scudder and de Bormans (pseudonym Dubrony) made important contributions. Many other older authors whose names are too numerous to mention added a little to our knowledge though their influence to the general trend of systematics in the order was usually slight.

The end of the 19th century and beginning of the 20th marks the real commencement of the systematic study of Dermaptera. It was at this time that the first papers by the Dermapterist par excellence appeared, to whose studies we owe nearly all that is good in the present classification of the order, and not a little of what is bad. Dr Malcolm Burr commenced his studies at an early age and for nearly twenty years was the leading specialist on the Order. In 1900 de Bormans published his valuable and much criticised monograph in "Das Tierreich," and Burr owed much to the impetus which this work gave him. De Bormans' friendship and help and the gift of his collections to the young student must have been immensely powerful in stimulating Burr to that prodigious burst of publication for which he is famous and occasionally maligned, and which he maintained for twenty years. Under heavy business responsibilities Burr carried on his work with unremitting vigour until the Great War put "finis" to his work as it did to that of so many others. It is a pity that Burr was not able to complete the structure he was building step by step, and it would be unfair for us to judge hastily the errors and lacunae which he left. Anyone who has studied his papers and books can see that he was struggling almost alone with an intricate group and inadequate material, bringing it each year into a more satisfactory state, casting out his own and others errors as his knowledge progressed, and treating the work from a philosophical angle new to the Order in those days.

Early in the century Verhoeff, in a series of almost incomprehensible papers, laid down certain principles which served Burr as a basis for his work, especially when the crudities of Verhoeff's papers had been corrected by his disciple Zacher. To Zacher we owe the systematic study of the genitalia of these insects, paramount to the building up of a phylogenetic classification, which Burr expanded in his valuable contribution published in 1915-1916.

Shortly after Burr commenced his studies Borelli published his first Earwig paper and continued, in close touch with Burr, to write descriptive papers and notes up to so recent a date as 1932. Most of Borelli's work was restricted to the establishment of new species and occasional new genera, so that he influenced the general state of the Order far less than did his contemporary Burr.

Rehn commenced descriptive papers in 1905 and has continued to date. Busy with Orthoptera, only part of Rehn's entomological work has been given to the *Dermaptera*. In recent years in association with Hebard and lately with Rehn, junior, this writer's work has assumed considerable importance. Hebard, too, has independently published some very important researches which have contributed in no mean way to clearing up obscurities unavoidably left by Burr.

With Hebard opens the "modern" field as far as this Order is concerned and to mention a few names associated with its systematic investigation at present may seem undesirable, yet it is impossible to omit reference to the contributions of Bey-Bienko (a pupil of the great Semenov Tian Shansky, also a *Dermapterist* of merit), Chopard, Günther, Maccagno, Menozzi, Moreira and Ribeiro.

The abundance and wide distribution of *Forficula auricularia* together with its special advantages as an object for biological research has led to an immense literature by authors without a systematic bias. This valuable and interesting field has never been co-ordinated, and anyone with library facilities could do valuable work by summarising and collating all that has been written on this insect. Since Meinerts' "Anatomia Forficularum" (1863) a constant stream of papers has appeared dealing with many aspects of the economy of this abundant species. Some of these contributed are monuments of careful and intricate study furnishing data of the greatest possible biological value. It is impossible to mention the authors whose studies have produced the voluminous literature of this branch, but the names of Kuhl, Przi Bram, and Weyrauch serve to indicate something of its character.

The British field is so limited that we can only say that in thinking of our few native species we shall always connect with them the names of such workers as Leach, Stephens, Lucas, Worthington, and of course Burr.

In conclusion we may say that of the contributions to our knowledge all others fade into insignificance compared with that of Burr. His work has been the basis on which all modern study is built. However we may disagree with some details the general structure is sound. Burr's contributions to the "Genera Insectorum," "Fauna of British India," his Genitalia Study (1915-16) and immense number of shorter papers, his superb collection containing nearly 200 types preserved in the British Museum—all the results of twenty years spare-time work, constant enthusiasm and application and some good fortune—forms a contribution to be proud of and it will not be forgotten.

A BRIEF HISTORY OF THE ENTOMOLOGIST'S RECORD AND JOURNAL OF VARIATION.

By H. E. PAGE, F.R.E.S.

For some years prior to 1890 James William Tutt took up the study of British Lepidoptera. He was possessed with boundless energy and in addition was well equipped with stores of information in most of the sciences, especially in Botany, Geology, Agriculture, Sound, Light, Heat, and Chemistry.

Moreover, he was a keen observer with an open mind, and he missed nothing in wood, field, or marsh that crossed his path.